Automatic network configuration with dynamic churn prediction

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Abstract: Peer-to-Peer (P2P) systems have been deployed on millions of nodes worldwide in environments that range from static to very dynamic and therefore exhibit different churn levels. Typically, P2P systems introduce redundancy to cope with loss of nodes. In distributed hash tables, redundancy often fixed during development or at initial deployment of the system. This can limit the applicability of the system to stable environments or make them inefficient in such environments. Automatic network configuration can make a system more adaptable to changing environments and reduce manual configuration tasks. Therefore, this paper proposes an automatic replication configuration based on churn prediction that automatically adapts its replication configuration to its environment. The mechanism termed dynamic replication mechanism (dynamic RM) developed and evaluated in this paper is based on exponential moving averages to predict churn that is used itself to determine a replication factor meeting a certain reliability threshold. Simulations with synthetic data and experiments with data from torrent trackers show that the behavior can be predicted accurately in any environment, from low churn rates to diurnal and high churn rates.

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